- 1. A method for determining whether a test subject has at least one auto-immune disease comprising
- a) obtaining blood from the predetermined test subject thus obtaining a test sample;
- b) obtaining blood from a non-autoimmune subject thus obtaining a control sample;
- c) contacting the test sample and the control sample with a combination of at least one detectably-labeled anti-CD4 antibody and at least one detectably-labeled anti-CD40 antibody;
- d) detecting the level of CD4<sup>lo</sup> CD40<sup>hi</sup> T cells in the test sample and in the control sample;

wherein when there is an increase in the level of CD4<sup>lo</sup> CD40<sup>hi</sup> T cells in the test sample as compared to the level of CD4<sup>lo</sup>CD40<sup>hi</sup> T cells in the control sample, the test subject has at least one auto-immune disease.

- 2. The method of claim 1 further comprising isolating the test sample CD4<sup>lo</sup> CD40<sup>hi</sup> T cells and the control sample CD4<sup>lo</sup>CD40<sup>hi</sup> T cells from part 1d) and determining the presence or absence of an increase in production of at least one cytokine in the test T cell population as compared to the sample T cell population.
- 3. The method of claim 2 wherein said cytokine is at least one cytokine selected from the group consisting of Il-2, IL-4, IL-6, IL-10, TGFβ and IFNγ.
- 4. The method of claim 1, wherein the auto-immune disease is selected from the group consisting of type 1 diabetes, rheumatoid arthritis, lupus, multiple sclerosis, atherosclerosis, Crohn's colitis, ulcerative gastritis, primary biliary cirrhosis, chronic obstructive pulmonary disease (COPD) and scleroderma.
- 5. The method of claim 4, wherein the auto-immune disease is type 1 diabetes.
- 6. The method of claim 4, wherein the COPD disease is emphysema.

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7. The method of claim 1, wherein said detecting is by flowcytometry.

- 8. The method of claim 1, wherein said subject is human.
- 9. A method for determining whether a predetermined test subject is susceptible to developing at least one predetermined auto-immune disease comprising
  - a) obtaining a first sample of blood from said predetermined test subject;
  - b) obtaining a second sample of blood from said same subject;
- c) detecting the CD4<sup>lo</sup> CD40<sup>hi</sup> T cell population in said first and second samples;
- d) contacting said second test sample with at least one predetermined antigen indicative of at least one predetermined auto-immune disease for a length of time and in an amount sufficient to obtain a positive or negative cellular response in the CD4<sup>lo</sup> CD40<sup>hi</sup> T cell population of said second sample,
- e) determining whether a positive or negative cellular response occurs in the CD4<sup>lo</sup> CD40<sup>hi</sup> T cell population of said first and said second samples by measuring at least one response selected from the group consisting of CD4<sup>lo</sup> CD40<sup>hi</sup> T cell proliferation, CD4<sup>lo</sup> CD40<sup>hi</sup> T cell death and CD4<sup>lo</sup> CD40<sup>hi</sup> cytokine production,

wherein when a positive response occurs in the CD4<sup>lo</sup> CD40<sup>hi</sup> T cell population of the second sample as compared to the response from the CD4<sup>lo</sup> CD40<sup>hi</sup> T cell population of the first sample, the predetermined subject is susceptible to developing the at least one predetermined autoimmune disease.

- 10. The method of claim 9, wherein a positive response is an increase in CD4<sup>lo</sup> CD40<sup>hi</sup> T cell proliferation, an increase in CD4<sup>lo</sup> CD40<sup>hi</sup> T cell death and an increase in production of at least one cytokine produced by said CD4<sup>lo</sup> CD40<sup>hi</sup> T cell population.
- 11. The method of claim 10 wherein said at least one cytokine is selected from the group consisting of Il-2, IL-4, IL-6, IL-10, TGFB and IFNy.
- 12. The method of claim 9 wherein said at least one preselected auto-immune disease is type 1 diabetes and said antigen is pancreatic tissue.

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13. The method of claim 9 wherein said at least one preselected auto-immune disease is rheumatoid arthritis and said antigen is synovial tissue.

- 14. The method of claim 9, wherein said at least one preselected auto-immune disease is multiple sclerosis and said antigen is nervous tissue.
- 15. The method of claim 9, wherein said at least one preselected auto-immune disease is scleroderma and said antigen is skin tissue.
- 16. The method of claim 9, wherein said at least one auto-immune disease is atherosclerosis and said antigen is cardiac tissue.
- 17. The method of claim 9, wherein said subject is human.
- 18. A method of modulating the proliferation of CD4<sup>lo</sup> CD40<sup>hi</sup> T cells in a subject in need of said modulation comprising at least one method selected from the group consisting of
- a) contacting said subject with at least one agent which inhibits the activation of RAG recombinase activity;
- b) contacting said subject with an antibody molecule, or fragment thereof, to CD40;
- c) contacting said subject with an antibody molecule, or fragment thereof, to CD154;
- d) contacting said subject with at least one blocking peptide to prevent interaction of the CD40 receptor with the CD154 ligand;
- e) contacting said subject with at least one RNA molecule specifically hybridizing to the RAG2 gene product; and,
- f) contacting said subject with at least one RNA molecule specifically hybridizing to the RAG1 gene product;

wherein said contacting is for a length of time sufficient and in an amount sufficient to modulate the proliferation of CD4<sup>lo</sup> CD40<sup>hi</sup> T cells in said subject.

19. The method of claim 18, part a), wherein said at least one agent is a chaetochromin or a derivative thereof.

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20. The method of claim 18, part b), wherein said antibody fragment is an Fab portion.

- 21. The method of claim 18, part c), wherein said antibody fragment is an Fab portion.
- 22. The method of claim 18, part d), wherein said blocking peptide is selected from the group consisting of SSKTTSVLQWAEKGYYTMSNNLVT (SEQ ID NO: 7) and QIAAHVISEASSK (SEQ ID NO: 8).
- 23. The method of claim 18, part e), wherein said RNA molecule is selected from the group consisting of
- 5'-AUGUCUCUGCAGAUGGUAACdAdG-3' (SEQ ID NO: 9);
- 5'-CUGUUACCAUCUGCAGAGACdAdU-3' (SEQ ID NO: 10);
- 5'-GGUAGGAGAUCUUCCUGAAGdCdC-3' (SEQ ID NO: 11);
- 5'-GGGGAUGGGCACUGGGUCCAUGdCdU-3' (SEQ ID NO: 12);
- 5'-AGCAUGGACCCAGUGCCCAUCCdCdC-3' (SEQ ID NO: 13); and,
- 5'-CUGUUACCAUCUGCAGAGACdAdU-3' (SEQ ID NO: 14).
- 24. The method of claim 18, part f), wherein said RNA molecule is selected from the group consisting of
- 5'-AUGGCAGCCUCUUUCCCACCCAdCdC-3' (SEQ ID NO: 15);
- 5'-GGUGGGUGGGAAAGAGGCUGCCdAdU-3' (SEQ ID NO: 16);
- 5'-AAACUUGCAGCUCAGCAAAAAACdTdC-3' (SEQ ID NO: 17);
- 5'-GAGUUUUUUGCUGAGCUGCAAGUUdUdU-3' (SEQ ID NO: 18);
- 5'-GAGUUUUUUGCUGAGCUGCAAGUUdUdU-3' (SEQ ID NO: 19);
- 5'-UCACAAAACCCUGGCCCAUGUUdCdC-3' (SEQ ID NO: 20); and,
- 5'-GGAACAUGGGCCAGGGUUUUGUdGdA-3' (SEQ ID NO: 21).
- 25. The method of claim 18, wherein said subject has an increased level of CD4<sup>lo</sup>CD40<sup>hi</sup> T cells as compared to the level of CD4<sup>lo</sup>CD40<sup>hi</sup> T cells in a non-auto-immune subject and the modulation is a decrease in the level of CD4<sup>lo</sup>CD40<sup>hi</sup> T cells.

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- 26. The method of claim 18, wherein said subject is human.
- 27. A kit for detecting CD4loCD40hi T cells comprising
- a) at least one detectably labeled anti-CD4 antibody and at least one detectably labeled anti-CD40 antibody; and,
- b) at least one predetermined antigen indicative of at least one predetermined autoimmune disease.